

## REMARKS

Claims 1-12 are pending.

Claims 1-12 are rejected.

Claims 1-9 are amended.

### **35 USC 101 and 35 USC 112, second paragraph**

Applicants have amended the claims to read alkenyl succinic anhydride rather than ASA. Support for this amendment may be found in the abstract and first paragraph, page 1 of the present disclosure.

Applicants have amended claim 5 to include a step. Support for this amendment may be found on page 2, first paragraph of the present disclosure.

Claim 9 is amended to eliminate the multiple dependency of the original claim. Support may be found in original claim 9 and claim 1.

No new matter is added.

The Applicants believe the above amendments overcome the Examiner's 101 and 112, second paragraph rejections.

### **35 USC 102(b) AND 35 USC 103(a)**

Claims 10-12 are rejected under 35 USC 102(b) as anticipated by or, in the alternative under 35 USC 103(a) as obvious over Tansley et al, US 5,626,719.

The Examiner states that "if the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. The Examiner cites *In re Thorpe*.

However, the Applicants respectfully believe the Examiner to be mistaken in his assessment.

It is clear from the MPEP that:

PRODUCT-BY-PROCESS CLAIMS ARE NOT LIMITED TO THE MANIPULATIONS OF THE RECITED STEPS, **ONLY THE STRUCTURE IMPLIED BY THE STEPS.**

The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g., *In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) (holding "interbonded by interfusion" to limit structure of the claimed composite and noting that terms such as "welded," "intermixed," "ground in place," "press fitted," and "etched" are capable of construction as structural limitations.)

The present situation corresponds more closely to *In re Garnero* rather than *In re Thorpe* as there is clear structure present in the product-by-process claim 10; that is, the alkenyl succinic anhydride sizing agent incorporates a maximum of 1% by weight of polymeric residues. Tansley mentions nothing about the % polymeric residues present in alkenyl succinic anhydride sizing. One skilled in the art can only assume that Tansley had in mind conventional alkenyl succinic anhydride which would normally contain 7-10 wt % of polymeric residues. See page 3, paragraph 3 of present disclosure.

Furthermore, the Applicants have provided evidence within the disclosure that the product is different and unobvious when examined in light of the prior art. On page 7 of the present disclosure, Table 1 shows clearly that the wt. % polymeric residue present in commercially available alkenyl succinic anhydride is above 7 wt. %. See Batches A-D. The distilled alkenyl succinic anhydride (the invention) contains very low levels of polymeric residue (a maximum of 1 wt. %). Thus there is a structural difference between the alkenyl succinic anhydride described in Tansley and the presently claimed product-by-process alkenyl succinic anhydride of claim 10.

Additionally, the Applicants show improved performance for the low level polymeric residue alkenyl succinic anhydride as opposed to the conventional alkenyl succinic anhydride.

**In regard to hydrolysis products, Table 2:**

The emulsion alkenyl succinic anhydride prepared with low level polymeric residues has a lower rate of hydrolysis when compared to the conventional alkenyl succinic anhydride.

**In regard to the sized paper or board, table on page 13:**

A comparison between <0.4 wt. % polymeric residue alkenyl succinic anhydride sizing on paper board (inventive product-by-process) when compared to conventional 7-9 wt. % polymeric residue show clear superiority of the inventive product-by-process. The advantages are:

Better colour,

Better hydrolytic stability,

Better sizing performance (HST stands for Hercules Sizing Test),

Better lactic acid resistance and

Better peroxide resistance.

Tansley does not consider the wt. % polymeric residue in alkenyl succinic anhydride sizing an important criteria for the sizing of paper board. Applicants have determined that the wt. % polymeric residue in alkenyl succinic anhydride is indeed important.

As there is a structural difference between the alkenyl succinic anhydride described in Tansley and the presently claimed product-by-process alkenyl succinic anhydride of claim 10, there is no anticipation by Tansley.

Additionally, as the Applicant has shown that there are unobvious advantages of low polymeric residues in alkenyl succinic anhydride sizing on paper board, the product-by-process cannot be obvious in light of Tansley, the 103(a) rejection is improper.

**35 USC 103(a)**

Claims 1-12 are rejected under 35 USC 103(a) as being unpatentable over Tansley et al in view of Fakoukakis et al US 4,956,478.

The Applicants agree that Tansley does not disclose the polymeric residues or olefin content of the alkenyl succinic anhydride. The Examiner has cited Fakoukakis as disclosing a method for making nearly pure alkenyl succinic anhydrides. In particular the Examiner alleges that Fakoukakis discloses examples of a product comprising about 99% alkenyl succinic anhydride. See column 5, lines 33-36 and column 6, lines 1-3).

The key issue seems to be what is disclosed in Example 10 of Fakoukakis et al. There are more olefins in the reaction mixture than needed in example 10: 13.88 (=7.48+6.41) moles of olefins and 9.19 moles of maleic anhydride. After 5 hours the reaction is stopped and vacuum distillation took place which removed 4.94 moles of unreacted olefins. So the rest of the olefins (reacted or even unreacted) stay in the residue, the amount thus being 8.94 (=13.88-4.94) moles.

**This does not say anything about the purity of the residue; there can be an undefined amount of polymeric residues and even unreacted starting materials (olefins and maleic anhydride ) in addition to the desired product (alkenyl succinic anhydride).**

To put it simply, Fakoukakis et al discloses in Example 10 only that at least 4.94 moles of olefins did not react with maleic anhydride as this amount was distilled away. It does not prove that the rest of olefins (8.94 moles) did react. And even if 8.94 moles has reacted, this does not say anything about the formation of polymeric residuals.

There is no suggestion in Tansley or Fakoukakis to purify the final product to remove polymeric residues to the level of the present claim 1.

The Applicants respectfully point out that it is entirely conventional to remove excess olefin by distillation under reduced pressure after the reaction of olefins with maleic anhydride to produce alkenyl succinic anhydride. See page 4, paragraph 4 of the present disclosure.

Fakoukakis et al carries out just such a conventional distillation. Unreacted olefin is removed by distilling the reaction product at 150 C/15-4 Torr. See column 5, line 30 and line 52-53.

This conventional distillation is quite different from that disclosed by the Applicants. In order to produce alkenyl succinic anhydride with low polymeric residues, the "crude" alkenyl succinic anhydride is distilled at sufficiently reduced pressure to "distill over" the alkenyl succinic anhydride. See page 4, step (iii), second paragraph.

Fakoukakis et al discloses only the conventional distillation to remove unreacted olefin. Fakoukakis discloses pressures from 15 to 4 Torr and temperatures of 150 C. This pressure is equivalent to 20 mbar to 5.333 mbar. This is far greater pressure than that used in the present disclosure. See

laboratory distillation on page 6 wherein the pressure is 1mbar and temperatures between 200-210 C. See plant distillation on page 6 wherein the pressure is 0.2 mbar and a temperature of 150 C and a second stage distillation of 0.04 mbar and a temperature of 165 C.

Because Fakoukakis et al does not distill at high enough temperatures or at sufficiently reduced pressures, no alkenyl succinic anhydride product is distilled over to give a low polymeric residue of the present claims. Thus Fakoukakis cannot make obvious the presently claimed composition as he only discloses the removal of unreacted olefins. Thus Fakoukakis cannot make obvious the presently claimed composition as he only discloses conventional removal of unreacted olefins. There is no enablement providing for removal of polymeric residues.

Furthermore, the presently claimed paper sizing composition is unobvious in light of Tansley and/or Kakoukakis because the presently claimed composition shows unexpected advantages as discussed above.

Reconsideration and withdrawal of the rejection of claims 1-12 is respectfully solicited in light of the remarks and amendments *supra*.

Since there are no other grounds of objection or rejection, passage of this application to issue with claims 1-12 is earnestly solicited.

Applicants submit that the present application is in condition for allowance. In the event that minor amendments will further prosecution, Applicants request that the examiner contact the undersigned representative.

Respectfully submitted,



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